Objectives

- Describe the impact of insulin resistance and hyperglycemia on vessel disease.
- State the factors and complications associated with vascular disease.
- List management goals to reduce risk of vascular disease.
- Discuss strategies to promote health.

Resources and Sources

9. Cardiovascular Disease and Risk Management: Standards of Medical Care in Diabetes—2018

American Diabetes Association
Diabetes Care 2018 Jan; 41(Supplement 1): S86-510A.
https://doi.org/10.2337/dc18-S009
Diabetes in America 2018

- 30.3 million or > 9.4%
- 27% don’t know they have it
- 37% of US adults have pre diabetes (86 mil)
- Increasing rates 3 key factors
  - Aging of U.S. Population
  - Increasing size of higher-risk minority populations
  - Declining mortality among those with diabetes

The relationship between BMI and the risk of developing type 2 diabetes

<table>
<thead>
<tr>
<th>BMI (kg/m²)</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;22</td>
<td>2.0</td>
<td>2.3</td>
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<tr>
<td>22-23</td>
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<td>2.8</td>
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<tr>
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<td>26-27</td>
<td>7.0</td>
<td>1.9</td>
</tr>
<tr>
<td>27-28</td>
<td>8.1</td>
<td>1.8</td>
</tr>
<tr>
<td>28-29</td>
<td>9.2</td>
<td>1.7</td>
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<td>29-30</td>
<td>10.3</td>
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<td>30-31</td>
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<td>34-35</td>
<td>15.6</td>
<td>1.5</td>
</tr>
<tr>
<td>35+</td>
<td>16.6</td>
<td>1.5</td>
</tr>
</tbody>
</table>

BMI – Visual Image

- BMI 17.5: Normal
- BMI 20.5: Overweight
- BMI 24.0: Obesity
- BMI 30: Morbid obesity
- BMI 40: Highest obesity
Natural History of Diabetes

- **Normal**
  - FBG <100
  - Random <140
  - A1c <5.7%

- **Prediabetes**
  - FBG 100-125
  - Random 140-199
  - A1c ~ 5.7-6.4%
  - 50% working pancreas

- **Diabetes**
  - FBG 126 +
  - Random 200 +
  - A1c 6.5% or +
  - 20% working pancreas

Development of type 2 diabetes happens over years or decades

Poll question 1

Which of the following BEST describes insulin resistance?

- a. Lack of sufficient insulin receptors on fat and muscle cells.
- b. Visceral adipose tissue.
- c. A physiological condition where insulin becomes less effective at lowering blood glucose levels.
- d. Excessive triglyceride levels
**Insulin Resistance is the Seed**

- Muscles are insulin resistant
  - Building muscle decreases insulin resistant
- Fat cells become more insulin resistant
  - Leads to more Free Fatty Acids and Triglycerides
  - More vascular inflammation
- Pancreas becomes fatty
  - Losing wt helps improve

**Insulin Resistance**

- **β-cell dysfunction**
  - Increased glucagon release from α-cells
- **β-cell degeneration**
  - Reduced insulin secretion from β-cells
- Increased glucose production
- Decreased glucose uptake and expression of GLUT4

**Hyperglycaemia**

**Vascular Disease & Diabetes “atheroscleropathy”**

- Normal endothelial cells are protective
- Abnormal glucose = Endothelial cell dysfunction
  - Lower Nitric Oxide levels = Poor vasodilation
  - Release of inflammatory mediators
  - Higher aldosterone levels > angiotensin = HTN
  - Adipokines from visceral fat increase inflammation
  - Increased risk of acute thrombotic event
- Increased arterial stiffness
  - Due to chronic hyperglycemia, endothelial inflammation
Poll question 2

Which of the following Cardiovascular Conditions are associated with diabetes?

A. Congestive Heart Failure
B. Hypervasodilation
C. Acanthosis Nigricans
D. CardioNephritis

Heart Disease & DM = 3-5xs Risk

- CHF
  - 7.9 % w/ diabetes vs. 1.1 % no diabetes
- Heart attack
  - 9.8 % w/ diabetes vs. 1.8 % no diabetes
- Coronary heart disease
  - 9.1 % w/ diabetes vs. 2.1 % no diabetes
- Stroke
  - 6.6 % w/ diabetes vs. 1.8 % no diabetes

Adapted from Bergenstal et al. 2000; International Diabetes Center.
Where Does Insulin Resistance Start?

And continues

And continues

And continues
Acanthosis Nigricans (AN)

- Signals high insulin levels in bloodstream and is a marker of insulin resistance
- Patches of darkened skin over parts of body that bend or rub against each other
  - Neck, underarm, waistline, groin, knuckles, elbows, toes
  - Skin tags on neck and darkened areas around eyes, nose and cheeks.
- No cure, lesions regress with treatment of insulin resistance

Weight loss, Prevention and CVD

- PreDiabetes = increased CVD risk
- For every 2.2 pounds of weight loss, risk of type 2 diabetes was reduced by 13%.
Risk of CVD Is Elevated prior to Diagnosis of Type 2 Diabetes

<table>
<thead>
<tr>
<th>Relative Risk of MI or Stroke</th>
<th>Non-diabetic throughout study</th>
<th>15 yrs or more before diagnosis</th>
<th>10-14.9 yrs before diagnosis</th>
<th>&lt;10 years before diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>3.00</td>
<td>3.64</td>
</tr>
</tbody>
</table>

*MI = myocardial infarction. Nurses Health Study


Factors Associated with Insulin Resistance

- Abdominal obesity
- Sedentary lifestyle
- Genetics / Ethnicity
- Gestational Diabetes
- Polycystic ovary syndrome
- Acanthosis Nigricans
- Obstructive Sleep Apnea
- Cancer

Factors Associated with Insulin Resistance

- Hyperinsulinemia (resistance)
- Hyperglycemia
- Hyperlipidemia
- Hypertension
- Hyper“waistline”emia (35“ women, 40” men)

Manifestations of Insulin Resistance
Poll question 3

- What is the current B/P goal for people with diabetes.
  - A. 130/80
  - B. 140/80
  - C. 120/70
  - D. 140/90

Start Metformin therapy

- For women with PreDiabetes and History of GDM
- Metformin reduces risk of diabetes
- Metformin helps decrease CV Risk

Patti Labelle
“divabetic”
“I have diabetes, it doesn’t have me”
Diabetes is also associated with:
- Alzheimer’s
- Depression
- DM and Insulin Resistance Associated with:
  - Fatty liver disease
  - Obstructive sleep apnea
  - Cancer; pancreas, liver, breast
  - Cardiovascular disease

Cardiovascular Disease is the Leading Cause of Death – CV Management Goals

Poll question 4
- What is the relationship between diabetes and cardiovascular disease?
  A. Diabetes is associated with a lower rate of congestive heart failure.
  B. Diabetes is associated with decreased incidence of heart attack and stroke
  C. People with diabetes are destined to get CV complications.
  D. People with diabetes can decrease their risk of a CV event through medications and lifestyle changes
Cardiovascular Disease and Risk Management

- Cardiovascular disease is the leading cause of mortality and morbidity in diabetes
- Largest contributor to direct and indirect costs
- Controlling cardiovascular risk improves outcomes
- Large benefits are seen when multiple risk factors are addressed globally

“Legacy Effect”

- For participants of DCCT and UKPDS
  - Long lasting benefit of early intensive BG control prevents
    - Macrovascular complications
      - 42% reduction in CV disease
      - 57% reduction in nonfatal MI, Stroke or CVD death
    - Microvascular complications
  - Even though their BG levels increased over time
  - Message – Catch early and treat aggressively

A 78 yr old man, smokes ppd

- A1c was 8.1%, swollen gums
- B/P 136/76 AM BG 100, 2 hr pp 190
- Chol – TG 54, HDL 46, LDL 98
- Meds:
  - Insulin – 16 units Lantus at HS
  - Benazepril 20 mg
  - Metoprolol 50 mg
  - Warfarin 5 mg
  - Actos 15 mg

What class of meds is this patient on?
Any special instructions?
Any med missing?
He complains of foot pain
Vascular Risk Factors

- Nonmodifiable
  - Duration of diabetes – longer = more risk
  - Age – older increased risk
  - Gender – women have more CV protection pre-menopause
  - Race – risk varies
  - Genetics – family history

- Modifiable
  - Blood Pressure
  - Lipids
  - Smoking
  - Obesity
  - Dietary Habits
  - Other factors – lack of exercise, Type A personality
Poll Question 5

Which of the following is the best recommendation to protect cardiovascular health?
A. Avoid all fast foods
B. Stop smoking
C. Keep B/P as low as possible
D. Eliminate sugar from diet

Smoking and Diabetes

Smoking increases risk of diabetes 30%

- Ask at every visit
- Assess
- Advise
- Assist with stop smoking
- Arrange for referrals
- Organize your clinic

Periodontal disease and Heart Disease

Heart disease link:
- Oral bacteria enter the blood stream, attach to fatty plaques in coronary arteries increasing clot formation
- Inflammation increases plaque build up, which may contribute to arterial inflammation
- Hyperglycemia = Gingivitis = Heart Disease
Cardiovascular Disease and Risk Management

- Cardiovascular disease is the leading cause of mortality and morbidity in diabetes
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- Controlling cardiovascular risk improves outcomes
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Diabetes & Heart Disease Motivational Stats

- Every 18 mg/dl increase in fasting glucose increases risk of CV events/death by 17%
- Every 1% increase in A1c increased:
  - CVD events by 18%
  - MI events by 19%
  - All cause mortality by 12-14%
  - Microvascular disease by 35%

Lifestyle Therapy

<table>
<thead>
<tr>
<th>Nutrition</th>
<th>Physical Activity</th>
<th>Sleep</th>
<th>Behavioral Support</th>
<th>Smoking Cessation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Achieve optimal weight</td>
<td>- 300 minutes of moderate aerobic activity per week</td>
<td>- About 7 hours per night</td>
<td>- Community engagement</td>
<td>- Nicotine products</td>
</tr>
</tbody>
</table>
| - Calcium intake | - Strength training | | - Alcohol moderation | | +
| - Fiber intake | - Increase physical activity | - Sleep hygiene | | - Nicotine replacement therapy |
| - Healthy fats and lean protein | | | | +
| | | | | |

ADA Stds

Heart Disease & DM = 3-5xs Risk

- CHF: 7.9% w/ diabetes vs. 1.1% no diabetes
- Heart attack: 9.8% w/ diabetes vs. 1.8% no diabetes
- Coronary heart disease: 9.1% w/ diabetes vs. 2.1% no diabetes
- Stroke: 6.6% w/ diabetes vs. 1.8% no diabetes
**Gastric Bypass Surgery**

- 35% of people with diabetes overweight
- 35% of people with diabetes obese (BMI 35+)
- Treatment Options limited
  - Post Gastric bypass diabetes remission* rates
    - 72% at 2 years
    - 36% at 10 years
  - Gastric bypass seems to support a lower CVD event rate and all-cause mortality

ADA Stds *Remission = BG normal range w/out meds

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**Poll Question 6**

- The 2018 ADA Standards of Care include updates to the Cardiovascular Disease and risk management section. Which of the following accurately reflects updates to this section?
  
  A. All hypertensive patients with diabetes should monitor home blood pressure.
  
  B. All patients with type 1 diabetes should be started on an ACE Inhibitor.
  
  C. Beta blockers should be avoided for all patients on insulin therapy
  
  D. Start patients on combo of ACE + ARB if patient has resistant hypertension

---

**CV Disease Management**

- The ADA maintains B/P target of 140/90, based on comprehensive review of studies (including ACCORD BP trial findings)

Current ADA Recommendations are as follows:

- Hypertension, sustained blood pressure ≥ 140/90 is major risk factor CV and microvascular complications.
- B/P meds & therapy reduce CV events, heart failure, and microvascular complications.

Screening and Diagnosis Recommendations

- Measure B/P at every routine clinical visit.
- If B/P (≥ 140/90) confirm B/P using multiple readings, including measurements on a separate day, to diagnose HTN

All hypertensive patients with diabetes should monitor their blood pressure at home.
BP Goal

BP < 140 / 90

- Some pts may benefit from B/P 130/80 (younger and achieved with undue tx burden)
- Pregnancy targets for those w/ hypertension 120-160 / 80-105

Hypertension Guidelines

Screening – Check BP at each visit.
If either
- systolic 140 or >
  diastolic 90 or > repeat on separate day.

Hypertension = Repeat systolic or diastolic above or equal to these levels

When taking B/P
- Pt sit still for 5 min’s
- Feet on floor,
- Arm supported at heart level
- Right size cuff

BP Treatment in addition to Lifestyle

- First Line B/P Drugs
- If B/P ≥ 160 /100 start 2 drug combo
  - Any of the 4 classes of BP meds can be use to tx hypertension (without albuminuria).
  - This includes ACE Inhibitors, ARBs, thiazide-like diuretics or calcium channel blockers.
    (Avoid ACE and ARB at same time)
  - Multiple Drug Therapy often required
  - For best effect, administer at least one at bedtime
Recommendations for the treatment of confirmed hypertension in people with diabetes.

*An ACE inhibitor (ACEi) or ARB is suggested to treat hypertension for patients with UACR 30–299 and strongly recommended for patients with UACR ≥300 (Urine Albumin to Creatinine Ratio).

**Thiazide-like diuretic; long-acting agents shown to reduce cardiovascular events, such as chlorthalidone and indapamide, are preferred.

***Dihydropyridine calcium channel blocker.

Dyslipidemia Management

- Start with statin and lifestyle
- Reduce trans, saturated fat, cholesterol
- Increase intake of omega-3 fatty acids, viscous fiber, and plant stanols/sterols
- Contained in grains, vegetables, fruits, legumes, nuts, and seeds. Also added to margarine, OJ and other food products
- Lose weight (if indicated)
- Get Active

Statin Recommendations

<table>
<thead>
<tr>
<th>Age</th>
<th>ACSVD</th>
<th>Recommended statin</th>
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</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>No</td>
<td>None + lifestyle</td>
</tr>
<tr>
<td>&lt;40</td>
<td>Yes</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If LDL &gt;70, despite max statin dose consider adding additional therapy such as ezetimibe or PCSK9 Inhibitor</td>
</tr>
<tr>
<td>&gt;40</td>
<td>No</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;40</td>
<td>Yes</td>
<td>If LDL &gt;70, despite max statin dose consider adding additional therapy such as ezetimibe (Zetia) or PCSK9 Inhibitor</td>
</tr>
</tbody>
</table>

ASCVD Risk include: LDL >100, HTN, Smoke, Chronic Kidney Disease, albuminuria, family hx ACSVD, if pt can't tolerate intended statin dose, use maximally tolerated dose.
Statin Therapy

- High intensity statins (lowers LDL 50%):
  - Lipitor (atorvastatin) 40-80mg
  - Crestor (rosuvastatin) 20-40mg

- Moderate intensity (lowers LDL 30-50%)
  - Lipitor (atorvastatin) 10-20mg
  - Crestor (rosuvastatin) 5-10mg
  - Zocor (Simvastatin) 20-40mg
  - Pravachol (pravastatin) 40 – 80mg
  - Mevacor (lovastatin) 40 mg
  - Lescol (fluvastatin) XL 80mg
  - Livalo (pitavastatin) 2-4mg

Dyslipidemia Management

- Intensify lifestyle therapy and optimize glucose control for patients with:
  - Triglycerides ≥ 150 and/or
  - HDL ≤ 40 (men) ≤50 (women)

Ongoing Therapy and Monitoring With Lipid Panel Recommendations

- In adults not taking statins or other lipid-lowering therapy, obtain a lipid profile at:
  - initial medical evaluation
  - every 5 years thereafter if < of 40 years, or more frequently if indicated.
- Obtain a lipid profile at initiation of statins or other lipid-lowering therapy
  - 4–12 weeks after dose change and
  - annually to monitor the response to therapy and inform adherence.
Antiplatelet Agents

- Consider aspirin therapy (71-162 mg/day)
- In pts who can’t tolerate, use Plavix, (clopidogrel)
- Combo therapy of aspirin + clopidogrel is reasonable for a year after MI
- As a primary prevention strategy for T1 or T2 at increased CV risk (10 yr risk >10%)
- Includes most men or women w DM age ≥ 50 years, with at least 1 additional risk factor:
  - Family history of premature ASCVD
  - Hypertension
  - Smoking
  - Dyslipidemia
  - Albuminuria

Coronary Heart Disease

- In pts with known CVD, use:
  - Aspirin or Clopidogrel (Plavix)
  - Statin
  - B/P Med
    - In pts with prior MI, Beta Blockers should be continued at least 2 years after the event
    - Don’t use Actos or Avandia in pts with CHF
    - In pts with stable CHF, Metformin can be used in renal function normal and stable

A 78 yr old man, smokes ppd

- A1c 8.1%, slurred speech
- B/P 136/76    AM BG 100, 2 hr pp 190
- Chol – TG 54, HDL 46, LDL 98
- Meds:
  - Insulin – 16 units Lantus at HS
  - Benazepril 20 mg
  - Metoprolol 50mg
  - Actos 15 mg
  - Daily aspirin

What class of meds is this patient on?
Any special instructions?
Any med missing?
Quick Question 7

78 year old, A1c 8.1, LDL 98, smokes ppd. Based on ADA guidelines, what med is missing?

a. Sulfonylurea
b. Vitamin D
c. SGLT2 Inhibitor
d. Statin

Signs of A Stroke

Beyond F.A.S.T. – Other Symptoms

Sudden NUMBNESS or weakness of face, arm, or leg, especially on one side of the body

Sudden CONFUSION, trouble speaking or understanding speech

Sudden TROUBLE SEEING in one or both eyes

Sudden TROUBLE WALKING, dizziness, loss of balance or coordination

Sudden SEVERE HEADACHE with no known cause

ABCs of Diabetes

A1c less than 7% (avg 3 month BG)

Pre-meal BG 80-130

Post meal BG <180

Blood Pressure < 140/90

Cardiovascular risk reduction

Eval if statin therapy indicated
Microvascular Complications

"Every time you see your doctor, take off your shoes and socks and show your feet!"

For patients with loss of protective sensation, foot deformities, or a history of foot ulcers
- Comprehensive foot eval each year to identify risk & promote prevention

Mr. Jones - What are Your Recommendations?

**Patient Profile**
64 yr old with type 2 for 11 yrs. Hx of CVD.

Labs:
- A1c 9.3%
- HDL 37 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 152/94

**Self-Care Skills**
- Walks dog around block 3 x’s a week
- Bowls every Friday
- 3 beers daily
- What meds?
- What referrals?
- My foot hurts

LR Life Study

- Diabetes Type 2 for 8 years
- On glyburide for 8 years
- A1c 8.7%
- Doesn’t know how to check blood glucose
- Smokes pack per day
- Has calluses on his feet that he trims with a razor
Diabetes and Amputations

- Diabetes = 8 fold risk of amputations
- Highest rate in those over 75
- 50% of amputations can be avoided through self-care skill education and early intervention
- Rate declined by 65% from 1996-2008
  - From 11.2 per 1000 to 3.9 per 1000

Stats from CDC 2012

Lower Extremities

- Lift the Sheets and Look at the Feet

On exam
  - Skin brownish, reddish, mottled
  - Skin warm to touch, may be edematous
  - May have stasis ulcers on lower leg
  - Pulses difficult to locate due to edema

Treatment
  - Support hose
  - Elevate feed
  - Avoid constriction
  - Shoes that can accommodate feet

Peripheral Vascular Disease – Venous Disease
Peripheral Arterial Disease (PAD)

- Affects 30% of people w/ dm over age 50
- Inadequate blood & oxygen to lower extremities
- Signifies ↑ risk of stroke, HTN, sudden death
- Pain w/ walking, relieved by rest "intermittent claudication"
- Pt c/o pain, cramping in calves, thighs, buttocks
- PAD + Neuropathy = increased amputation risk

Peripheral Arterial Disease
Intermittent Claudication

- Physical Exam – Skin
  - Pale or blue, purple
  - Dependent rubor, blanching when elevated
  - Cool to touch, loss of hair, nonhealing wounds, gangrenous
  - Diminished pulses
  - Treatment = Protect feet
  - Avoid constriction, increase walking, stop smoking, medications and/or surgery

Foot Care Standards ADA

- Provide foot care education to pts w/ diabetes
- High risk pts – use multidisciplinary approach
  - Wound specialist, Vascular specialist, Pedorthist etc.
- Refer to foot care specialists for lifelong surveillance if:
  - smoke, loss of protective sensation, structural abnormalities, hx of lower extremity complications
- Initial screen for PAD includes:
  - Assess for intermittent claudication and pedal pulses.
  - Refer high risk pts for further vascular assess and consider exercise, meds, surgical options.
Profile of a High Risk Foot ADA
- Previous amputation
- Previous foot ulcer history
- Peripheral neuropathy
- Foot deformity
- Peripheral vascular disease
- Vision impairment
- Diabetic neuropathy (esp if on dialysis)
- Poor glycemic control
- Cigarette smoking

Foot Deformities

No Bathroom Surgery
You Can Make A Difference

› Assess
  › Nail condition, nail care, in between the toes
  › Who trims your nails
  › Have you ever cut your self?
  › Shoes – type and how often
  › Socks
  › Skin/skin care and vascular health
  › Ability to inspect
  › Loss of protective sensation

5.07 monofilament delivers 10gms linear pressure

Free Monofilaments
http://www.hrsa.gov/leap/

10 Free Monofilaments
www.hrsa.gov/hansensdisease/leap
Three Most Important Foot Care Tips

- Inspect and apply lotion to your feet every night before you go to bed.
- Do NOT go barefoot, even in your house. Always wear shoes!
- Every time you see your doctor, take off your shoes and show your feet. Report any foot problems right away!

Fight Back Against Vessel Disease

- Lifestyle changes
  - 5 – 7% body weight loss
  - 30 minutes activity daily + strengthening
  - Check your feet
- Medications
  - Statins
  - B/P - ACE, ARBs, CCBs, diuretics
  - Aspirin, anti clotting agents
  - BG Meds – Metformin
  - Quit Smoking
Thank You

Please contact us if you have any questions!
We are here to help!
530 / 893-8635
bev@diabetesed.net

www.DiabetesEd.net